NOVEMBER/DECEMBER 2024

DOPH25A/GOPH25A — SPECTROSCOPY AND LASERS

Shanmuga Industries Arts & Science College T.V.Malai

Time : Three hours Maximum : 75 marks

SECTION A — (10 × 2 = 20 marks)

Answer ALL questions.

1. Which type of molecules are microwave active? Give examples.

2. Sketch an asymmetric top molecule.

3. What types of molecules will give rise to IR spectra? Give the selection rule for the IR spectra.

4. How many vibrational degrees of freedoms are there for CO_2 molecules?

5. Is Raman scattering a coherent scattering? Give reasons for your answer.

6. What are stokes lines?

7. State the principle of laser.

8. Differentiate spontaneous emission and stimulated emission in lasers.

9. What are the different types of lasers?

10. Mention the advantages of solid state lasers.

SECTION B — (5 × 5 = 25 marks)

Answer ALL questions.

11. (a) Explain the working of a microwave spectrometer with a block diagram.

Or

(b) Discuss about the linear and symmetric top molecules.

12. (a) Explain virbational energy of a diatomic molecule using Morse curve.

Or

(b) What are normal modes of molecular vibration? Explain in detail with example of H_2O.

13. (a) Mention the characteristics of Raman lines.

Or

(b) Explain vibrational Raman spectra.

14. (a) Discuss the conditions to achieve laser action.

Or

(b) Explain the role of optical resonators in lasers.

15. (a) With suitable energy level diagram explain the working of He Ne.

Or

(b) Discuss the various applications of laser in (i) industry (ii) medical.

Shanmuga Industries Arts & Science College T.V.Malai

SECTION C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. Discuss the rotational spectra of a rigid diatomic molecule.

17. With neat sketch explain the principle and working of FTIR.

18. Explain the instrumentation and working of laser Raman spectrometer.

19. Discuss various methods of achieve population inversion.

20. Describe the construction and working of CO_2 laser and explain with the help of an appropriate energy level diagram, how lasing takes place in the CO_2 laser.

———————